

1010

Question Booklet Code

Question Booklet Sr. No.

A

Roll No.

OMR Sheet No.

1745-O

Ph. D. ENTRANCE TEST, Nov. 2017

ELECTRONICS (Allied)

First Paper

(Objective Type Questions)

Time : 60 Minutes

Maximum Marks : 100

Number of Pages in this Booklet : 12

Number of Questions in this Booklet : 50

Instructions for the Candidates

- (i) Check this booklet carefully for the sequence of pages and questions. If it is defective due to pages/questions missing or not in serial order or any other discrepancy it should be got replaced immediately from the invigilator within the period of 5 minutes. Afterwards neither the Question Booklet will be replaced nor any extra time will be given.
- (ii) After this verification write your Roll No. and OMR Sheet Number on this Question Booklet.
- (iii) **Use only Black or Blue** ball point pen.
- (iv) This paper consists of **50** multiple-choice type questions. Each question has four alternative responses (a), (b), (c) and (d). **Only one of these alternative responses is correct.** You are required to darken completely the circle of correct answer in the OMR Sheet.
- (v) There is **no negative marking.**
- (vi) Do not write anything other than relevant entries or put any mark on any part of the OMR Sheet, which may disclose your identity, otherwise you will render yourself liable to disqualification.
- (vii) Use of electronic gadgets such as pager, cell phone, calculator and log table etc. is prohibited.
- (viii) Rough Work may be done in the end of this booklet.
- (ix) You have to **return the OMR Sheet** to the invigilator at the end of the examination compulsorily.
- (x) In case of any discrepancy in English and Hindi version English version should be taken as final.

SEAL

PH. D. Entrance Test, Nov. 2017

ELECTRONICS (ALLIED)

First Paper

(Objective Type Questions)

Time : 60 Minutes

Maximum Marks : 100

1. The Newton Raphson method formula for finding the square root of a real number R from the equation $x^2 - R = 0$ is :

(a) $x_{i+1} = \frac{1}{2} \left(x_i + \frac{R}{x_i} \right)$

(b) $x_{i+1} = \frac{3x_i}{2}$

(c) $x_{i+1} = \frac{1}{2} \left(3x_i - \frac{R}{x_i} \right)$

(d) $x_{i+1} = \frac{x_i}{2}$

2. If Laplace transform of $F(t) = \sin at$ is $\frac{a}{s^2 + a^2}$, then Laplace transform of $F(t) = t \sin at$ is :

(a) $\frac{2as}{(s^2 + a^2)^2}$

(b) $\frac{a}{s(s^2 + a^2)}$

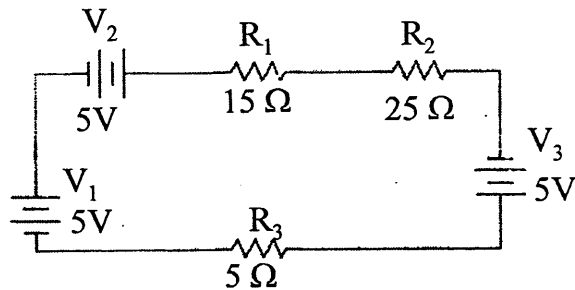
(c) $\frac{2as}{(s^2 - a^2)^2}$

(d) $\frac{a}{s(s^2 - a^2)}$

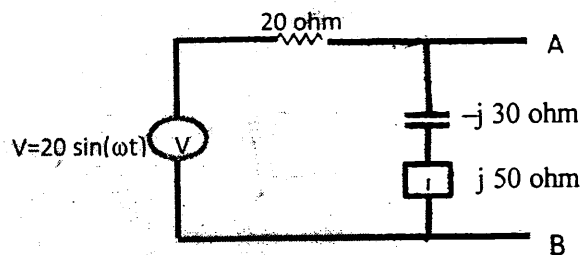
3. A practical current source is usually represented by :

- (a) A resistance is parallel with an ideal voltage source
(b) A resistance is series with an ideal current source
(c) A resistance in parallel with ideal current source
(d) None of the above

4. The clockwise current in the circuit shown in the figure is :



- (a) -333 mA
 (b) -222 mA
 (c) 3.33 mA
 (d) 333 mA
5. Which value of load impedance Z_L is necessary to be connected across terminals A and B for maximum power transfer in the circuit shown in the figure ?



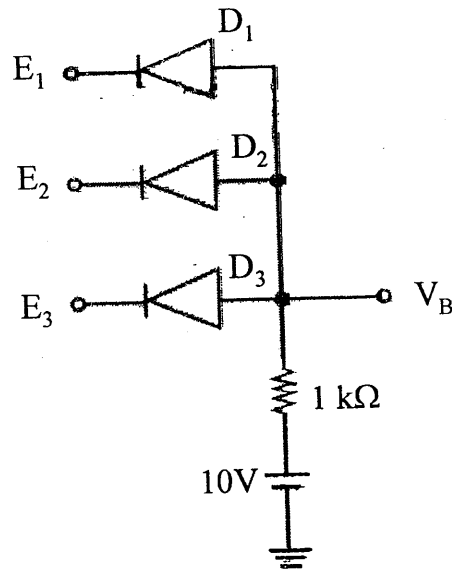
- (a) $10 - j 10 \text{ ohm}$
 (b) $5 + j 5 \text{ ohm}$
 (c) $5 - j 5 \text{ ohm}$
 (d) $10 + j 10 \text{ ohm}$

6. What is printed when the given sample code is executed ?
- ```
int y[4] = {6, 7, 8, 9};
int*ptr = y + 2;
printf("%dn", ptr[1]);
```
- (a) 7 (b) 8  
(c) The code will not compile (d) 9
7. A transistor with a forward current gain  $h_f$  of 150, is connected to a load. The load consists of a tank circuit with  $L = 400 \mu\text{H}$  and  $10 \text{ ohm}$ , and  $C = 200 \text{ pF}$ . If the input resistance is  $3 \text{ k ohm}$ , voltage gain will be :
- (a) 5,500 (b) 10,000  
(c) 2,750 (d) 6,500
8. The phenomenon known as Early Effect in a bipolar transistor refers to a reduction in base width caused by :
- (a) Electron hole recombination at base  
(b) The forward bias of emitter base junction  
(c) The early removal of stored base charge during saturation to cut-off switching  
(d) The reverse biasing of base collector junction
9. If mobility of an electron in Si at 300 K is  $1200 \text{ cm}^2/\text{V.s}$ , then the diffusion coefficient of the electron is :
- (a)  $31.01 \text{ m}^2/\text{s}$  (b)  $15.50 \text{ m}^2/\text{s}$   
(c)  $31.01 \text{ cm}^2/\text{s}$  (d)  $15.50 \text{ cm}^2/\text{s}$





18. In the circuit shown diodes  $D_1$ ,  $D_2$  and  $D_3$  are ideal and the inputs  $E_1$ ,  $E_2$  and  $E_3$  are 0 V for logic 0 and 10 V for logic 1. What logic gate does the circuit represent ?



- (a) 3 input OR gate  
 (b) 3 input AND gate  
 (c) 3 input NOR gate  
 (d) 3 input XOR gate
19. If  $(734)_8 = (x)_{16}$ , the value of  $x$  is :
- (a) D C 1  
 (b) C 1 D  
 (c) 1 D C  
 (d) 1 C D
20. A 4-bit synchronous counter uses flip-flops with propagation delay times of 15 ns each. The maximum possible time required for change of state will be :
- (a) 30 ns  
 (b) 45 ns  
 (c) 60 ns  
 (d) 15 ns

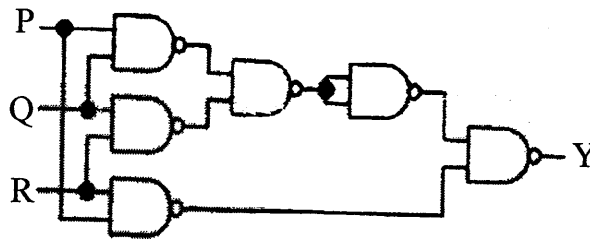
21. The figure of merit of a logic family is given by :

- (a) (fan out)  $\times$  (propagation delay)
- (b) gain bandwidth product
- (c) (propagation delay)  $\times$  (power dissipation)
- (d) (nose margin)  $\times$  (power dissipation)

22. The ESC instruction of 8086 may have two formats. In one of the formats no memory operand is used. Under this format, the number of external op-codes (for the co-processor) which can be specified are :

- (a) 256
- (b) 512
- (c) 128
- (d) 1024

23. The output Y of the circuit below is '1' when :



- (a) two or more of the inputs P, Q, R are - 1
- (b) two or more of the inputs P, Q, R are - 0
- (c) any odd number of the inputs P, Q, R is - 0
- (d) any odd number of the inputs P, Q, R is - 1



24. Which of the following instructions of an 8086 microprocessor uses the content of a CX register as a counter ?
- (1) LOCK
  - (2) LOOP
  - (3) ROTATE
- (a) Only (1) and (3)                      (b) Only (1) and (2)
- (c) (1), (2) and (3)                    (d) Only (2) and (3)
25. The longest wavelength that can be absorbed by silicon which has a band gap of 1.12 eV is :
- (a)  $0.633 \times 10^{-6}$  m                      (b)  $0.87 \times 10^{-6}$  m
- (c)  $0.5 \times 10^{-6}$  m                        (d)  $1.1 \times 10^{-6}$  m
26. For an air filled rectangular waveguide of dimensions 2.5 cm  $\times$  1.2 cm, the cut-off wavelength of the dominant mode is :
- (a) 2.4 cm                                      (b) 5.0 cm
- (c) 2.5 cm                                      (d) 3.7 cm
27. A coaxial line supports the following modes of propagation :
- (a) Only TE and TM modes
  - (b) Only TEM modes
  - (c) TE, TM and TEM modes
  - (d) Only TE modes

28. The attenuation in a typical optical fiber is 0.6 dB/km at 1310 nm wavelength. If 100  $\mu\text{W}$  power is launched into the fiber at 1310 nm, the power (in  $\mu\text{W}$ ) in the fiber after 10 km will be :
- (a) 1 (b) 16.6  
(c) 25 (d) 50
29. In the design of a single mode step index optical fiber close to cut off, the single mode operation is NOT preserved if :
- (a) radius as well as operating wavelength are halved  
(b) radius as well as operating wavelength are doubled  
(c) radius is halved as operating wavelength is doubled  
(d) radius is doubled as operating wavelength is halved
30. Which of the following is NOT a correct boundary condition at an interface between two media ?
- (a)  $\hat{n} \times (\vec{D}_1 - \vec{D}_2) = 0$  (b)  $\hat{n} \times (\vec{H}_1 - \vec{H}_2) = \vec{J}_s$   
(c)  $\hat{n} \cdot (\vec{D}_1 - \vec{D}_2) = \rho_s$  (d)  $\hat{n} \cdot (\vec{B}_1 - \vec{B}_2) = 0$
31. The electric field of a plane wave propagating in free space is given by  $\vec{E} = E_0(-0.5\hat{x} + A\hat{y}) \exp j[\omega t - k_0(0.866x + 0.5y)]$  V/m. The value of A is :
- (a) 0.866 (b) -0.866  
(c) 0 (d) 0.5
32. In an angle modulated signal  $x(t) = 6 \cos [2\pi \times 10^6 t + 2 \sin (800 \mu t) + 4 \cos (800 \pi t)]$  V, the average power of  $x(t)$  is :
- (a) 10 W (b) 18 W  
(c) 20 W (d) 28 W

33. If the number of bits per sample in a PCM system is increases from  $n$  to  $n + 1$  the improvement in signal to quantization noise ratio will be :
- (a) 3 dB (b) 6 dB  
(c)  $2n$  dB (d)  $n$  dB
34. If a binary PSK modulation is used for transmission, the required minimum bandwidth is 9.6 kHz. To reduce the transmission bandwidth to 2400 Hz the modulation scheme adopted should be :
- (a) 16 – ary QASK Modulation (b) 8 – ary PSK Modulation  
(c) 16 – ary PSK Modulation (d) 8 – ary QASK Modulation
35. What is the uplink and down link frequency of GSM ?
- (a) uplink 935-960 MHz and Down link 890-915 MHz  
(b) uplink 900-950 MHz and Down link 850-890 MHz  
(c) uplink 600-660 MHz and Down link 550-590 MHz  
(d) uplink 650-710 MHz and Down link 540-590 MHz
36. In a ruby laser, laser action is due to :
- (a) oxygen atoms (b)  $Al_2O_3$  crystal  
(c) aluminum atoms (d) chromium atoms
37. Klystron operates on the principle of :
- (a) Amplitude Modulation (b) Frequency Modulation  
(c) Pulse Modulation (d) Velocity Modulation
38. A cavity resonator can be represented by :
- (a) an LC circuit (b) an LCR circuit  
(c) a lossy inductor (d) a lossy capacitor

39. A circulator/isolator used in microwave waveguides works on the following effect :
- (a) Kerr effect (b) Pockel effect  
(c) Kelvin effect (d) Faraday rotation
40. The wavelength corresponding to the microwave frequency range is :
- (a) 30 to 300 GHz (b) 3 to 30 GHz  
(c) 0.3 to 3 GHz (d) 300 to 3000 GHz
41. The Q-factor of a parallel resonance circuit consisting of an inductance of value 1 mH, capacitance of value and a resistance of 100  $\Omega$  is :
- (a) 100 (b)  $2\pi$   
(c) 10 (d) 1
42. In measurement the degree of exactness compared to the expected value of the variable being measured is called :
- (a) Precision (b) Accuracy  
(c) Sharpness (d) Sensitivity
43. Strain gauge is a passive transducer which converts mechanical displacement into change in :
- (a) Resistance (b) Temperature  
(c) Inductance (d) Capacitance
44. The resistance of a nickel coil at 20°C is 25 $\Omega$  and it rises to 37.5  $\Omega$  when the coil is immersed in a liquid. If the temperature coefficient of nickel at 20°C is  $\alpha = 0.00625 /K$ , what is the temperature of the liquid ?
- (a) 80°C (b) 100°C  
(c) 120°C (d) 40°C

45. Temperature measurement with thermocouple is based on :
- (a) Peltier effect
  - (b) Seebeck effect
  - (c) Piezo-electric effect
  - (d) Thomson effect
46. In a  $4\frac{1}{2}$  digit voltmeter for voltage measurement on a 10V range, the voltages 12.98 V and 0.6973 V would be displayed as :
- (a) 12.98 and 0.6973
  - (b) 12.98 and 0.697
  - (c) 12.980 and 0.6973
  - (d) 12.980 and 0.697
47. Thin gate oxide in CMOS process is preferably grown using :
- (a) wet oxidation
  - (b) dry oxidation
  - (c) epitaxial deposition
  - (d) ion implantation
48. Photoresist layer is formed using :
- (a) silicon nitride
  - (b) polysilicon
  - (c) a light sensitive polymer
  - (d) silicon dioxide
49. The dopants are introduced in the active areas of silicon by :
- (a) only the diffusion process
  - (b) only ion implantation
  - (c) chemical vapour deposition
  - (d) either diffusion or ion implantation
50. Piranha solution used to clean silicon wafers after metal patterning consists of :
- (a) sulphuric acid and hydrogen peroxide
  - (b) nitric acid and hydrogen peroxide
  - (c) sulphuric acid and hydrofluoric acid
  - (d) hydrochloric acid and hydrogen peroxide.